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Professor William A. Newell
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H. B. Kipper et al. p. 1

The Birth of Immortal Life

From the Standpoints of Natural Philosophy
and the Mechanics of Inorganic
and Living Matter

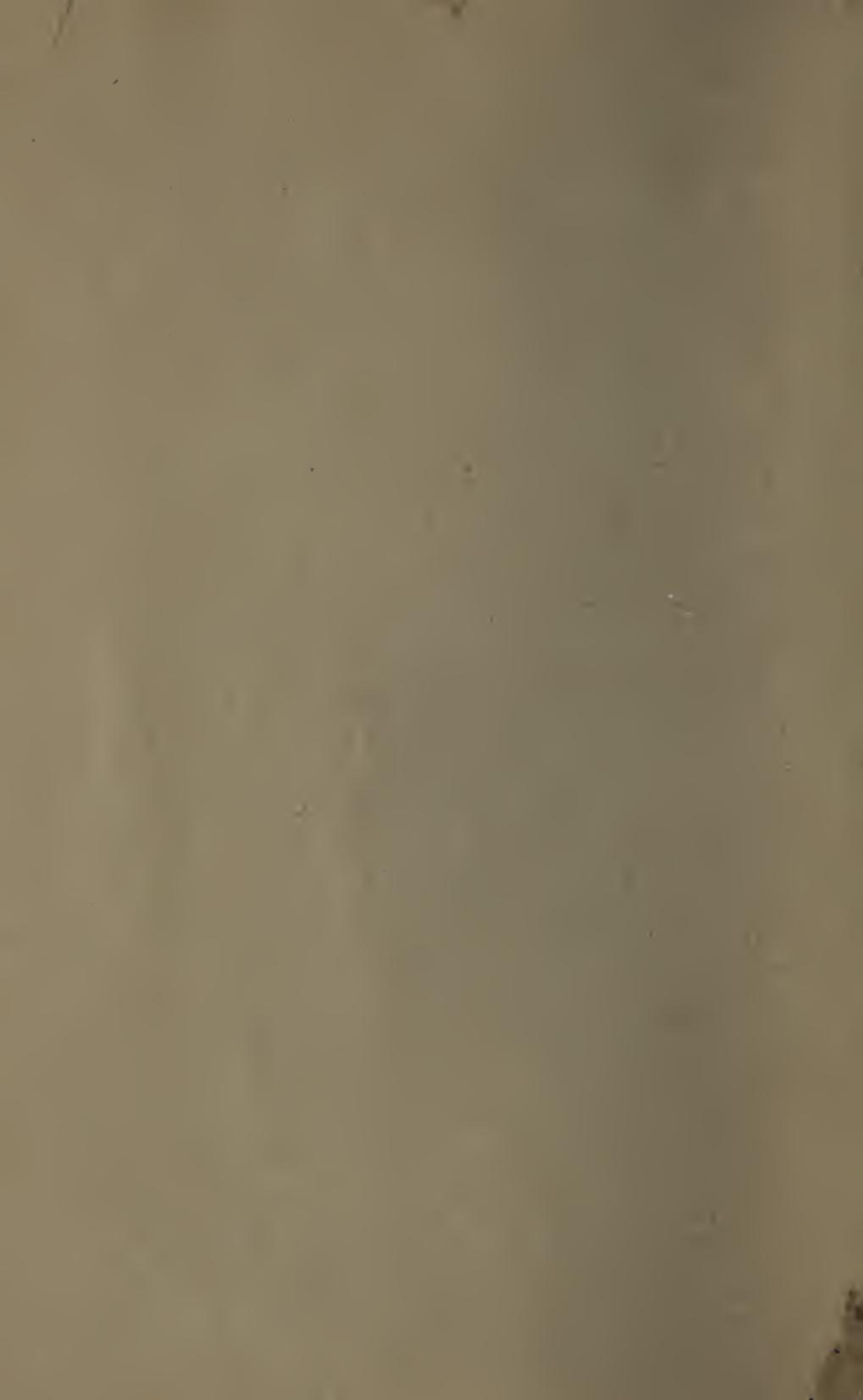
BY

H. B. KIPPER

CAMBRIDGE, MASS.

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INTRODUCTION

LET us imagine a number of tiny elastic particles rotating spirally and thus advancing through space, as obstructed by a resisting medium. Secondly, in order to prevent destruction of the spiral let us picture it as a unit revolving in the same direction as the particles but with an opposite spiral motion. In this manner both stability and position in space were given and the birth of organized inorganic matter took place. In a somewhat similar manner with the replacement of the particle by the atom the birth of protoplasmic or so-called living matter occurred.

From the latter point the path along which life is advancing has been blazed for us by Darwin. He did not show us, however, that Nature is building a life, adapted to all environment, and one of greater immortal strength than that accorded even to inorganic types of matter.

The animal which lived most perfectly by physical laws, determining the mould of the next higher form of life, gave to its offspring the character of this mould.

As the animal became more highly differentiated from its lower species, so as to live by greater mental acumen, it acquired the stamp of man.

Man must show obeisance to a higher code of physi-

cal, mental, and moral laws in order that his form of life may remain upon and dominate our sphere.

Finally, what is the mould, when regarded from a finite sense, for a higher form of life than man, and one born from him, which obeisance to these laws will determine?

The rising and falling of the tides, the following of day by night—all seem even qualitatively highly complicated until we consider the simple mechanical basis of the solar system. This is fully as true, the author is led to believe, with gravimetric and magnetic phenomena of the atom, and the concepts necessary for their qualitative interpretation are no more complicated than those of our solar system, and peculiarly, are highly analogous to these.

Even as the king's castle and the peasant's hut are built with their four walls and a roof, so Nature, uses the same principle of building her tiniest and greatest works.

The life of another planet might be very strange to us; life not confined to any planet but allowed the freedom of space, would it not be very, very different from our own? Men are highly organized finite units placed on a ball of matter floating through space; the surface of this ball, their environment, has given them legs for locomotion, and hands to serve their daily needs. What characteristics would Nature determine as most pertinent and practical for life permitted limitless freedom?

The strangeness of natural phenomena cannot stand as a barrier to their inception within the human mind. Birth alone has long ago torn asunder any such misplaced bars.

The beginning of organic life upon our sphere represented an attempt by matter to overcome gravity. Its culmination represents life which has absolutely overcome this force.

All life is struggling for broader environment and more perfect Immortality, the Battle of Existence.

The world is seeking for religious tenets having as their foundation that of nature. However strange this may appear, truth and reason will support it and the greater the opposition, the stronger, if truly embedded in nature, it will become.

The beauty that these tenets will unfold to man is in the picture of a reward for mental and moral cleanliness, even as Darwinism laid bare a picture for us portraying a reward for physical perfection.

Darwinism has given to us a foundation placed on rock for interpretation of life's secrets; it is only a foundation. Will civilization build a structure of strength and beauty sufficient to rest upon it?

THE BIRTH OF IMMORTAL LIFE

NO one can estimate the harm that is being done to our modern civilization by the fact that religious, scientific, and philosophical tenets differ so radically from one another. The true world structures of civilization certainly cannot arise until they are in entire concurrence. Knowledge is one; the structures possible therefrom are limitless, but can differ only in their attributes; the law of building is the same for all.

The gradual development from lower to higher forms of life is deduced by the Darwinian theory with wonderful precision—from the sea-water algae and urchin to the final attainment of man. The formation of the inorganic world from the simplest form of matter, the steps between this and the lowest forms of life, and the deduction of a final possible attainment of matter in its highest form—immortal cognizant life—are not attempted by it.

Energy, its vehicle, matter, and their combined resultant, motion, exist for man on all sides. Their workings are alone for him to understand. The creation of either of the first two, infinite space and time, will remain on the pages of a book forever closed to him. They can become clear only when as infinite factors they enter into life; it is only in their finite power that they exist for us.

Particles of matter of so small a size that billions of them perform their functions in the dilation or contraction of the pupil of an eye were created to consti-

tute the universe and exist as such for man. Following innumerable untold by-ways of space by means of their inherent energy, in thousands of myriads of years some of these particles became forced to move in regular paths, and in little combined groups of threes, fours, and greater numbers continued to revolve in the direction of greatest force.

The particles¹ in the "circlets," or groups, are forced to rotate in the opposite direction to the spiral revolution of the "circlets" themselves. The positive and negative motions act as attractive forces—internally productive of the atomic entity and externally productive of chemical attraction.

Let us now briefly consider a schematic representation of the atom, together with the changes taking place between the solid, liquid, and gaseous states, and also the latter state above the critical temperature.

We must first remember that there is no true "static" condition of matter, for every particle is moving with equal velocity and represents equivalent energy. Thus all static states are apparent, and we are led to believe in them merely because of the non-perceptibility of dynamic action.

In the solid state we have rotation of the particles in various separate groups of the "valence,"² but

¹The perfect elasticity and thus reciprocal energetic action of particles demand equal density, continuous matter, or equivalent energy to given space.

There is never loss or gain in the energy of particles, merely a change in direction of their motion.

²The *particle* is the smallest division of matter that exists. The *group* represents a disc or sphere of particles. The *valence* is a circle or system of groups.

Our so-called negative and positive elements are made up of negatively or positively directed matter. This direction of motion is produced by a right or left handed arrangement of dif-

a statical condition of the groups as regards the atomic centre and one another. In the liquid state we have not only rotation of the particles in the separate groupings, but also revolution of the groups themselves, analogous to the motion of the planets in our solar system. When the translatory motion of the group has become great enough to overcome their static condition, we get revolution of these, and the liquid or vapor state supersedes the solid. Besides this we have a slight translatory movement of the molecules dependent on temperature, and, as regards the length of the path of translation, pressure.

When finally the force of the translatory movement of the molecule is greater than the attractive power of molecule for molecule at their surfaces, the gas exists above the critical temperature.

The rise of temperature causes more rapid collision of atomic groupings; and because of the difference in numbers of particles and spirality of such groupings and the corresponding differentiated action of surrounding energy, we get actual group rotation³ together with translatory movement of the molecule. At the absolute zero, since there is no translatory motion, chemical action is impossible.

ferent sized spheres or groups. These groups are in turn made up of revolving particles.

A molecule of matter in the solid state we may compare to a cube with lines of attractive force emanating from its corners (at each corner there is a tiny screw); in the liquid state it is comparable to a cylinder (or cone) with fields of force at the ends. As so many cylinders the molecules may roll over one another. Molecules in the gaseous state we may consider as highly elastic balls with their attractive forces emanating from the center of gravity.

³The vibratory motion must finally become rotary, though probably at first of a marked elliptic character.

The selective attraction due to the statical arrangement of groups, and productive of the crystalline solid,¹ gives way to the atomic action of the liquid and is entirely lost above the critical temperature. In the latter condition the atoms themselves, acting merely as attractive centres, entirely predominate over the group-attractive forces.² The vapor below its critical temperature again may be liquified if the mean free path of translation be made small enough, for the atomic attractions will then again predominate.

In the colloid there exists revolution of the particle groupings, but a static condition of the atoms within the molecule. In such state from static atomic arrangement we have the wonderfully characteristic power of the solid for retention of properties, together with the activity of reaction of the liquid. The non-diffusibility of the large colloidal molecules, and this interrelated static and dynamic action, are in themselves conducive to the marvellous power and activity of our brain structure.

In the reaction taking place between positive and negative elements we have superposition of corresponding oppositely revolving spirals of corpuscular groups, partially analogous to the superposition of dextro and laevo forms of an optically active organic compound. We should expect, therefore, great intensity of reaction. The reaction between two positive atoms should have

¹In the solid we have vectorial lines of forces due to the spiral statical arrangement of the groups as regards one another. These lines of force give rise to the solid crystalline structure and are entirely lost in the liquid state.

²Every group represents a definite force. Their varying sizes and left or right handed arrangement in three dimensions of space give the wonderful constructive power used by Nature for upbuilding the "elements."

little intensity, for here we have two superimposed-like arrangements of particle groupings, which will not permit the analogous groups of each atom to come in contact.

In the permanent magnetic metal the spirality of particle groups in one portion of the atom is opposite to the particle spirality of the other and is of less intensity. The two portions are balanced by opposite spiral group revolutions. They may, however, by the magnetic current be reverted into two components, which instead of being balanced by an opposite group revolution, exactly balance one another. (Consider two screws with right and left handed threads and turning in the same direction.) In the non-magnetic metal these forces are not divided and exert simply the force of gravity.



greater intensity of particle rotation
greater intensity of group revolution

these forces stand balanced but give the negative and positive poles of the magnet.

In the "elements" helium, neon, argon, krypton and xenon the spheres "of the valence" balance one another in their negative and positive group arrangements so that the atoms which they comprise do not manifest chemical affinity.¹

¹That is we have both negative and positive motion, or rotation, and right and left handed arrangements of balanced matter in the iron group of metals, thus giving to them their magnetic properties—negative and positive balanced fields with their attractive powers projected without the atom—and high specific gravity, whereas in the chemically inactive elements we have a positive and negative arrangement but a positive or negative particle motion; an internal atomic structure which

Let us now examine a few of the atomic properties to see how they concur with the structural theory postulated.

If through a metallic wire we pass a current of electricity, the conductive power will be found to vary inversely with the temperature. Every degree by which we lower our wire in temperature below that of the melting point of ice increases the conductivity by a given fraction, 1-273; just as the addition of an increment to a force moving in a given direction will increase the same by an amount exactly equal to that by which a force moving in the opposite direction will be decreased. The translatory motion is increased by every degree of rise in temperature, with equivalent decrease in electrical conductivity.

In following the current through a solution of some salt, positive ions wander in one direction, negative ions in the opposite, just as the valence groups of the respective ions move in opposite spiral directions of force. But these ions must already have attained

would tend to lessen internal cohesion and give a low specific gravity.

As we might expect, the elements possessing this marked positive and negative form lie between the truer negative and positive elements, as illustrated by the Mendeléeff table. Thus, in a way, we may say, that they are made up of each of these latter. The inactive gas possesses half of the internal structure of both positive and negative elements, and the magnetic metal the full structure.

The "spirality" of the particles within the individual group and that of the groups within the atom" are always opposite and give to the atom its permanence. The arrangement is akin to that of a nut and bolt. Positive and negative spiral rotation or revolution are analogous to the spirality of a screw. Positive and negative group arrangement may be compared to the dextro and laevo atomic arrangement within the structurally optically active molecule. We thus see why a salt with its negative and positive arrangement, is a non-conductory of electricity, even

their freedom of dissociation, due to the greater attractive forces of the solvent, and, no longer tied by their chemical affinities, exist but as the independent ion. Otherwise the negative and positive groups of metal and non-metal respectively with their opposite direction of spiral revolution exactly neutralize, and we get the neutral salt, the non-conductor of electricity.

Thus, as the arrangement of atoms in so-called dextro and laevo molecules allows of their neutralizing powers, analogous arrangement of particle groups in the positive and negative atoms differentiates them from one another. The role of atomic groupings in the optically active molecule corresponds exactly to the role of varying numbers of particles within the groups of the atoms.

as two optically active compounds will neutralize one another and not rotate a ray of polarized light.

The following table should aid in the understanding of the above analysis:

Let "r" stand for a right-handed spiral arrangement of the particles within the group or spiral.

Let "l" stand for a similar left-handed spiral arrangement of the particles within the group or spiral.

Let "R" stand for a right-handed spiral arrangement of the groups themselves.

Let "L" stand for a right-handed spiral arrangement of the groups themselves.

Let the + sign stand for right-handed or clockwise motion and the — sign for a left-handed or counter-clockwise motion. We may then represent the various types of the atomic structure as follows:

Positive "elements" or metals: r L
 + +

Negative "elements" or non-metals l R
 — —

Inactive elements, the rarer gases r (or l) L and R
 + — + and —

Iron or magnetic group of metals r and l R (or L)
 + — — (or +).

Although no attempt has been made at a quantitative analysis in this short sketch, let us, nevertheless, examine the spectra of one of the simpler "elements," and of low atomic weight, as hydrogen. The relationship of the wave-lengths of the spectra of hydrogen may be expressed quantitatively, within the limits of experimental error, by the following vs. Balmer formula:

$$\lambda = h \frac{m^2}{m^2 - 4}$$

λ represents any wave-length. h is a constant, and m may be replaced by three, four, five, etc.

Now the smallest possible group which can exist to give directed motion must contain three particles. The velocities of rotation of particles in this group and those of the particles in the larger groups are the same. The translatory path of the smaller group is, however, larger, and this path decreases in a geometrical ratio with the increase in the number of particles of the groups—with the reverse order of oscillation frequency. If we allow an increase of a single particle in each successive group, the above formula exactly expresses the wave-lengths formed by these.

Actual attraction to one another would be the greatest hindrance for perfect structural power that we could postulate as a property of the particles. If they were thus endowed they would combine in all ascribable incongruous forms and exist as continuous non-interpretable matter. The particles are, in fact, definitely held apart until, through relationships of motion, they impress into service surrounding neighbors for aid in combination with other media.

It is the combination of particles by mathematical

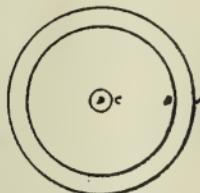
laws¹ to produce gravity that gives us our regular interrelated array of a hundred atoms; and their formation was along the lines of Nature, who worketh ever from the simpler to the more complex.

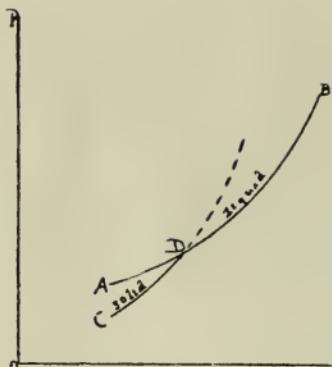
The surface of two spheres vary directly as the squares of their diameters. Gravity varies inversely as the square of the distance. Let us examine two spheres with diameters A and B and the common centre D . C represents an atom of revolving particles likewise with centre at D . The number of particles in the surface of the greater sphere will bear the ratio to the number of particles in the smaller sphere, $A^2:B^2$. The amount of directed energy evolved from C , transferred as rotary motion through intervening particles of perfect elasticity to surfaces B and A , is exactly the same. But on B it is distributed over the area B^2 , and on A over the area A^2 , or in the ratio $B^2:A^2$. The actual amount of directed energy therefore exerted on their surfaces through rotary motion varies inversely as the squares of the diameters of the spheres, or as gravimetric attraction.

If gravity was inherent to matter it would vary inversely as the cube of the distance; it is because of the arrangement of the particles within the many fine laminae of the atom representing the structure of all organized matter, to produce gravity, that the present law holds.

Let us now briefly consider a substance, as benzene, changing from the liquid to the solid state.

¹The simple mechanical laws which gravity determines demand but an equal simple mechanical interpretation of its forces as from the increment of directed motion, as postulated, and perhaps the simplest explanation of its workings.





"*A-B*,¹ the curve corresponding to liquid in contact with saturated vapour, is cut by *C-D* into two parts, the *D-B* corresponds to liquid benzene above the melting point, and therefore in a stable condition, the lower *A-D*, on the contrary, to liquid below the melting point, in the undercooled condition, which solidifies on contact with the smallest quantity of solid benzene, or on stirring, and may therefore be described as unstable. The line *C-D* corresponding to the solid state, may also be produced, and then to the right of *D* would represent solid above the melting point, a condition not only unstable but unrealizable, as for instance ice above 0° ."

At the point *D*, according to our theory, in following the line *A-B* in the direction from *B* to *A*, that is with a reduction of temperature, the internal lines of force of the atom are of such a nature that they tend to bring about a state of inertia, or a condition of small internal vibration or revolution, among the separate groups of the atom, and these, therefore, tend to assume positions of rest as regards one another and thus to form the crystalline structure. If these forces, however, do not bring about this statical arrangement exactly at the point *D*, but continue to allow the dynamic motion of the groups, we get the supercooled liquid.

In the process under consideration we are withdrawing energy from our system and in so doing we are

¹From the English by R. A. Lehfeldt of vant Hoff's "Lectures on Theoretical and Physical Chemistry," Vol. 1, p. 16.

lessening both group and atomic movements. Although the two paths representing the decrease in vibration energy of group and atomic units should, we believe, very nearly parallel one another, within definite limits the one might increase more readily than the other.¹ In the supercooled state the atomic vibrations are then still active enough (with necessarily increased vapor tension) to prevent the individual groups from exerting sufficient attraction for one another to produce the solid state of aggregation with its smaller vapour tension.

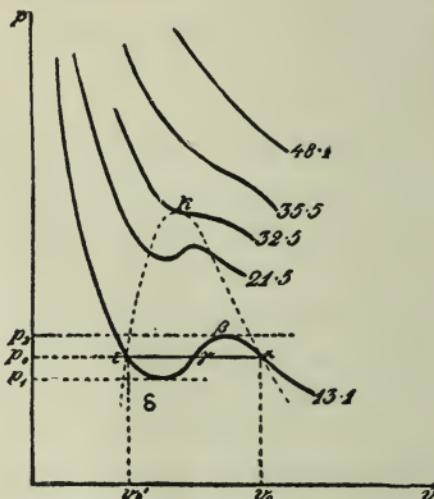
In this connection it is interesting to note that in following the line of cooling of a supersaturated liquid, as we should expect, there occur two points fairly well differentiated from one another, namely the so-called meta-stable and labile points of supersaturation. To produce crystallization in the former case it is necessary to add a crystal, however small, of the substance under consideration, whereas in the latter case it is sufficient to jar the liquid in order to produce immediate solidification. In the first case under consideration it is necessary to bring about not only a geometrical orientation of the atomic groups but also an arrangement of the atoms within the crystalline structure. (We must both make and lay our bricks!) For this purpose, as we should expect, a geometrical configuration, or crystalline structure, analogous to the one with which we are dealing, but already formed, should most readily serve. In the latter case, however, since the group atomic arrangement has already been brought about

¹The "spirality" of the particles within the groups and that of the groups within the atom must always balance; the spirals may, however, be very different—the path of one short and steep, of the other long and gradual.

and we are dealing with equilibrium of very slight stability, merely to disturb this equilibrium, as through a jar, should be sufficient to cause immediate crystallization.

Let us also glance at the phenomenon of a gas or vapour, as carbon dioxide, near its critical temperature.

The isotherms for a few different temperatures are plotted in the diagram:¹



By our theory above 32.5° , or the critical temperature of carbon dioxide, the force productive of vibration impact of any two molecules is always greater than the attraction tending to keep them together, so that no matter how great the pressure, or short the path of translation, the molecule can never assume the liquid state. The molecule in the gaseous state, exists, we remember, as a sphere. It does not possess the fully developed lines of attractive force emanating from each individual group of the crystal, nor is the attracting field, produced by the vibrating or revolv-

¹Nernst's Theoretical Chemistry, p. 219; 2nd English Ed., by R. A. Lehfeldt.

ing circle of groups, sufficient to hold the molecule in contact with its neighbor as in the liquid.

At a , on the isotherm of 13.1° , the free path of vibration has become so small that the attractive field, peculiar to the liquid and produced by the specific group vibrations, causes liqufaction.

Atomic vibrations tend to hinder the change of matter at a perfectly exact point from the gaseous to the liquid state, even as the group vibrations, collectively considered, tend to hinder such change from the liquid to the solid state. In other words the atomic identity retards the immediate expression of the group equation.

Between β and δ of the isotherm we get a peculiar trend to the curve. Let us examine this. This portion of the curve tends to weaken the van der Walls equation, for it seems to belie nature to say that in advancing over an isotherm in the same direction both pressure and volume can decrease. In the gaseous state we are dealing essentially with the atomic identity and atomic vibrations. At β , however, besides the specific attractive force derived from the field of revolving groups coming into play the attractive lines of force of the group tend also to exert themselves, but are, however, overcome by the too great vibrations of the groups. The sudden application of these forces not only tends to bring the molecules together but also tends to decrease their volumes. At the critical temperature there is no chance of the specific force derived from the revolving groups coming into play, so that our equation does not give us a portion of the curve analogous to the one which we have been considering, but merely the normal path.

By our theory it is the attractive force derived from this dynamic orientation, if we may thus term it, or field of revolving groups, that gives to the liquid its solvent power for specific salts, whereas gases mix in all proportions, and the solid has but a few isomorphous fellows with which it will crystallize.

In radium, according to the author's views, the negative spiral motion of the particles within the groups and the positive group spiral motion do not balance; disintegration, therefore, occurs, and the so-called, β and α , or negative and positive, rays are evolved. These in turn, since they represent merely a positive or negative arrangement of matter and, therefore, not a balanced one, rapidly break down to the final etherial particles.¹

The forward motion of the individual tiny "screw," or ray, is exactly compensated by its backward motion over its larger spiral path. This action is very analogous to the balancing of the force of gravity exerted by the sun upon the earth, by the energy of rotation of the earth. Once this balanced nature of the atom is destroyed, disruption occurs and the tiny "screw," or ray, rushes forward. It is capable of existence outside of the atom, however, for but a short space of time when it must break up into the particles from which it was formed.

In the few words which we allot to different phenomena in this exceedingly abbreviated sketch let us somewhat further consider the carbon atom.

In carbon, as is now generally believed, we are deal-

¹It is probable that in the case of radium we behold constant decomposition and reformation of elements; for mass action no doubt holds for matter in the case before us as for others already studied.

ing with a tetrahedral form of atom.¹ Its group attractive forces are derived, therefore, equally from all four corners, or faces if we will. Such atom exists, therefore, almost as a sphere with an exterior film or skin tending to compress it.

With an increase in temperature of the carbon atom the path of vibration of the groups, since they are attracted equally toward a common centre, does not tend to increase greatly, and the atom remains in a highly compressed condition and does not readily assume the liquid or gaseous state, volatilizing only at the highest temperature.

In the lower "negative elements" positive valence revolution and group rotation tend to balance so that these elements are poor electrical conductors. The higher valency of these elements establishes this view. In the negative elements of larger atomic weight the divergency is more marked so that the "elements" of this class are conductors.

The fact that the positive univalent atoms have large atomic volumes and are the best conductors of electricity is in entire concurrence with our theory. In these elements the single "valence" can exert but a small compressible influence since the attraction exists merely on a single surface. They are, however, excellent conductors since the groups do not themselves neutralize their power for conductance as we believe is so truly the case in the tetrahedral carbon atom.

In studying atomic forces there naturally arises the question whether electricity cannot be directly ob-

¹The simplest manner to picture the carbon atom, according to the author's idea of the same, is by four screws with their heads at the four corners of a tetrahedron and their points coming together at the center of gravity.

tained from carbon or coal. The carbon atom exists as a tetrahedron with its four valences symmetrically arranged. Thus the migration of such an atom, as ion, in a given direction to combine with a negative element is impossible, for each "valence" would exert an equal force and thereby tend to hold the atom motionless.

The small conductivity and great difficulty of volatilization of the carbon atom are also due to such symmetry of arrangement of its valence groups.

But let us leave the forces of the inorganic world and see how we are led to believe Nature continues in the building of her structures. Because of its more perfect symmetry the carbon atom is adopted as the building stone. One is cemented to another, at first so as to form the wall of her building, the chain of carbon atoms in a non-complex organic compound and analogous to the first movement of the particle in a straight line. The chain changes to the ring, the enclosing walls of the structure, which represents a repetition of the process as seen in the circlet of particles. The change to a totally enclosed space, the sphere of atoms as, but a moment ago, of particles, next occurs, and we behold the polymerized organic substance, as the cellulose of the plant.

The forms of matter thus far considered might represent either organic or inorganic types.

For the rise of the types which we designate as living we must, so to speak, start again from the beginning, with the mere replacement of the single particle by the carbon atom.¹ As such particles arrange them-

¹The underlying principle of any new form of life is a new form of motion. As there are three dimensions to space, and

selves in groups containing different numbers of ethereal particles to revolve in the direction of greatest force, so groups of atoms become affixed to the symmetrical carbon atom, to give the so-called dextro and laevo optically active bodies and analogous to the positive and negative elements.

The role of the optically active compounds, which exist in so large a proportion in brain and body, may be compared to that of the chemically active atoms. We find a great majority of the above constituents wherever physiological functions are highly active. A specific ferment will destroy one modification of such a compound and leave the other unharmed; and it always requires an analogous agent or more highly organized life to affect their separation. Forces which bring about the separation of other elemental compounds are absolutely inoperative towards these. There must exist, then, some closer relationship between their atomic groupings and organized life forms —even a sort of lock-and-key arrangement, as Amil Fisher aptly terms it.

matter tends to make use of all three, the simplest arrangement productive of a possible new type of life must be represented by a spiral. The atom was formed from an arrangement of spirals made of particles of the ether. First protoplasm was made up from a like arrangement of atoms. The tiniest particle spirals, the groups which we have been considering as parts of an atom, are akin to negative electrical charges, the larger spirals made up of the groups themselves to form the atom are analogous to the positive charge which we know is a much larger one. Both negative and positive forms must exist in the atom to give to it stability, even as a nut and bolt link one another together. Negative or positive particle spirals, depicting like electrical charges can exist in the free state merely a fraction of a second. Both negative and positive charges are omitted from radium in its decomposition. The third almost neutral, or Roentgen ray, might well be regarded as an almost neutral sphere, and one which should suffer almost instantaneous decomposition.

Between these optically active compounds and organized life species there exist the enzymes, or physiological solvents, which serve as tools for preparation of the food-stuffs used by the protoplasm for life energy.

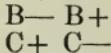
When the atomic groups contained in the optically active compound have become sufficiently differentiated, they tend completely to rotate the polarized light-wave. The latter, however, instead of being thus acted upon, itself produces, under right conditions for freedom of movement (the colloidal state), a slight rotation of the groupings of the optically active compound. That is, a certain amount of absorbed light energy is now exerted as vital force,¹ just as light-waves coming in contact with other forms of matter may subsequently be exhibited as heat or electricity.

¹That is, the principle of first organic life was a new mode of balancing right and left handed matter, in which the atom plays a role within the molecule analogous to that played by the particle within the atom. Thus it was the "chance" formation of the racemic form of the optically active compound that led to organic life. With the birth of this form of matter, as the protoplasm, the assimilation, we may say, or neutralization of gravity became possible.

Perhaps this property can be made clearer to the reader by considering molecules containing a number of kindred dextro and laevo atomic groups which tend internally to neutralize one another.

Let us start with two optically active molecules A + A— and B + B—. B— and A + partially neutralize one another and are chemically active; by reaction we get therefore the molecule A + A—. The latter is brought into contact with C + C—, also B— B +

chemically active toward B + B—. The molecule formed we may represent by A + A—. That is the molecule employs its



optically active groups as so many arms and hands to draw to it other kindred groups, combines these groups chemically within itself and continues this process until a point is reached at which the optically active halves internally neutralize and since these are not chemically combined they tend to separate from one another.

The above form of matter exhibits the character of the vegetable protoplasm; and when other surrounding forces than light-waves produce similar motion, we get the protoplasm of the animal.

The first force tending to impart activity to this form of matter is that produced by light-waves. Their directed energy may cause motion in it. This movement is opposite in character to that which light rays tend to impart to ordinary matter. In the latter case it is merely impact action and the object is driven backward. In the former case motion is produced akin to the turning of a screw and by which the screw is carried forward. Light-waves enervate this form of matter even as magnetic currents attract or repel magnetic matter. Growth takes place and toward the source from which these rays originate, or our solar sphere, and they tend to construct the plant.

Structurally, then, the protoplasm is very analogous to one of the forms of the optically active compound. The possibility of the dynamic action of the atomic groupings arranged statically the same in both occurs, however, merely in the former.

It is only in its power of forming the "individual" that the protoplasm differs radically from other matter and from the laws of chance in the above manner the individual structures possible to build would be limitless. Since the wonderful researches of Pasteur science has come to study closely the relationships existing between organic molecules optically active. This relationship is productive of a form of molecular attraction and it is both this force and chemical affinity that the author is led to believe the protoplasm makes use of.

By their employment and manner the cell or protoplasm (if existent in the colloidal state which is necessary for the group reaction) makes use of whole groups of atoms for its reaction, whereas the ordinary chemical reaction occurs between single atoms (or groups of particles) in solution. Groups of atoms may then form nuclei to interact with one another even as atoms represent nuclei of particles which may be active inter se.

Diagrammatically we may represent both of these conditions of matter in the same manner.

In reproduction the protoplasm first tends to attract groups of opposite nature. They in turn attract groups to themselves similar to those of the original molecular complex. The first groups then tend to come together and separate from the protoplasm. The new complex¹ when fully formed, since it represents a three dimensional-like arrangement of atomic groups similar to that of the parent, also separates from the latter.

The positive and negative portions form the unorganized ferment or enzyme. The latter in its catalytic properties is very analogous to the aqueous solvent, our greatest catalyst. Both tend to cause a form of dissociation of the molecule on which they act so that an intensified reaction may take place between the dissociated parts and other bodies. The enzyme²

¹The atomic structure and the manner of atomic arrangement determine but slight attractive power between the negative and positive portions of the above form of the optically active compound, so that they readily separate from one another—as so many crystals—when formed.

It is essentially in its power of constructing the individual unit that the protoplasm differs from other inorganic and organic matter, which must always form in the solid state the mere crystalline agglomerate.

The crude beginnings of both inorganic and organic life had as their basis this method of negatively or positively directing energy and a right or left handed structural arrangement permitted of this directing power.

²Let us consider the enzyme or solvent as made up of a negative and positive part, say C+ and D—, and the body to be acted on, or solute, as NaCl, of, say A— and B+. A+ and B— tend to combine with C+ and D— to form A+ B—. Through D— C+

combination energy is “internally” evolved.

Such energy is absorbed, at least in part, by A+ B— to change it to form the more stable solid to the less stable “gaseous state of solution,” or one in which the energy content and thus reactivity are both greatly increased. Partial dissoci-

uses its atomic groups even as the solvent employs its particle groups for attractive power to form the unstable intermediate body, from which merely by energy changes the final compound may be obtained.

Now what is the first function exhibited by the protoplasm, a function differentiating it from unorganized life forms and, excluding reproduction, perhaps its most prominent? From the seedling, through the agency of the sun's rays, there occurs an upward growth of the plant, away from the surface of the earth, and therefore directly opposite to, or against gravity. Now what should one who has studied the growth and differentiation of organic life predict as the outcome of such movement? Clearly, as a consummation to the protoplasmic power, a form of organized matter in which the possibility of motion from the earth against gravity should be complete. Do other formulated pictures along the lines of actual growth still point to the same ending? In the plant we have a slow continuous movement of matter directly against gravity; in the lower animal such action, manifoldly increased, allows of motion seemingly at will in all directions. How much more truly is such motion accentuated in

tion may, of course, also occur. The reaction may be either endothermic or exothermic, but the parts of the molecule, on which the catalyst is acting, have been changed from the inactive (solid) to the active (liquid) or (colloided) state.

We now bring into contact with dissolved NaCl, let us say AgNO_3 ions. Precipitation of AgCl takes place. The vectorial attractive forces of silver and chlorine ions are so great that this occurs. Their attractive force toward the solvent, water, in comparison with that existing between themselves, is very small. The vectorial forces between the atoms of the solute are lessened with solution and are dissipated between these and the solvent. If they, however, are of marked intensity for one another and of minimum attractive power for the solvent, solution will not occur.

the bird, which puts at naught all gravity in its smooth upward course.

Has God, then, finished his work of building with the bird, or is man approaching a still higher form of life even though for the moment he may again have been placed upon the earth that he may more readily till and work the soil and make duty and pleasure parallel? Is, then, what we designate as the soul approaching such a form of life, and if so, what is its relationship with the mind and protoplasm of our present life?¹

Before many years the scientific world will come to believe that every atom represents a mathematical expression,² and that it may be constructed from the free

¹The only phase that seems droll in man, our so-called representative of the highest form of matter, is that he has to supply energy to himself continually, to wash his body of decomposition products, and to be held within the prison confines of the earth by the bars of gravity.

²The conception that our world was a rotating ball and that man could walk upon it seemed preposterous and analogous to the idea that man could walk upon the ceiling to those of a few generations ago. The great size of the ball did not portray to them the natural picture in its true strength. The conception of the rotating forces of the atom, which to man is relatively infinitely smaller than our worldly sphere is large, may appear to many of our own generation even as the above idea seemed to those of a past one.

In each atom rotating matter or energy exists. The protoplasm is constructed from millions of these almost inconceivably small units. When organic life has finally gained the complete supremacy over inorganic forces, we may say that its determining motion is rotatory and that life has then perfect expressive power.

In the development of inorganic or monodynamic life three general steps were taken, all of which were characterized by a change in the predominating direction of motion; straight line motion was followed by a vibratory, and that in turn by a rotatory one. We, of course, behold the finally completed work in our solar or atomic system. In dualistic, or organic, life these three changes also peculiarly occur; in the plant the predominat-

—unless directed, absolutely non-perceptible—ether. The highest form³ of life is one that can represent all expressions.

Color and other properties of our elements show but their imperfections. Organized matter possessed of perfect objective power and thus adaptability to all environment, would possess no such properties.

The molecule of oxygen possesses a relatively marked adaptability to environment, and but few properties, when compared to the hard transparent diamond; and yet the imperfections of the latter are far less than those of the opaque steel. The density of gas may be many times that of oxygen, and yet the latter remains almost imperceptible to the senses. The surrounding ether has a density probably many score times that of the densest metal, and yet we cannot feel it.

What tremendous power may be entrusted to a little conducting wire without the slightest change in its appearance to the eye of man!

The free ether,⁴ with its density many hundred times that of our body, we cannot even detect since it represents balanced matter; the motion of every particle is reciprocally compensated by that of another. Now final and most highly organized life will have precisely this same property of the unorganized ether

ing motion is in a straight line, in the animal it is vibratory and it too must finally be followed by a rotatory one. The dualistic or balanced nature is also characteristic of this life, and through it the power of thought is given.

³From the struggle of the earthworm animal life has been one of gradually expanding freedom, and the increase of intelligence has paralleled the degree of freedom granted. With infinite freedom will come like sight.

⁴Lord Kelvin has mentioned that from our senses we should never even know the presence of the air.

from which it is born; namely, every particle constituting it will be reciprocally balanced.¹ The detection of the presence of this life by any of our senses or instruments is, therefore, impossible. This form of life, since no external force could act upon it, must be absolutely indestructible. The fact that physical indestructibility is the primal and only requirement of immortal life, in this our natural universe, those who wish to immortalize mortal flesh do not seem to have grasped.

This free ether constitutes by many billion fold the greater portion of our universe and yet we, who live in a realm almost nothing in comparison to its size, do not wish to countenance the possibility that it can support life. It would be far more plausible to expect, because of the spontaneous method of generation of life within our universe, that its greater portion, untrammelled by man, would be teeming with life.²

¹The kinetic theory of gases is applicable in its fullest degree to the free particles of the ether and explains why this surrounding medium even with its great density is not perceptible. The absolutely indestructible organized form of matter capable of construction from spiral atomic forms must have an analogous construction—every atom will have its motion compensated by the motion of some other atom and internally to the molecule. If this were not true and the motion of a single atom were externally balanced, it could be acted upon by chemical or other force and the structure in which it was situated would be capable of alteration and destruction.

²The opening of the eye unites us with environment the vastness of which is almost inconceivable to one who has never had the power of sight. The eye during its myriads of years of development in the animal and in the human race has gradually become a structure so perfect that it is able to subject to the use of the life of which it is a part many of the indulgences taking place among the particles of the ether, that is, light waves. But is there not a still higher possibility, the possibility of the existence of an organism, a form of life, a soul, call it what we will, which should be so organized that it must bear the relationship to all conditions of matter which the eye bears alone to light and not to the condition of matter existing for us as darkness?

In the changes taking place in any form of matter the non-stable always precedes the stable form.

It is hideous and belying Nature for man to consider that she is not upbuilding an individual form of life of even greater immortal strength³ than that accorded to atomic matter from which she is building.

The human body is made up of millions of little living organisms, each in itself complete, and possessing sufficient adaptability to environment for life and for the fulfilment of its small duty. At a period in man's development, certain cells assume the perfect qualitative character of the larger individual and coincidentally greatly increased power.

Analogous to the formation of the spermatozöon at puberty from a given cell, is the production of the soul from the mind. The full environment of its universe, the body of man, has been inflected within the cell. As the cell must have perfect strength to meet all environment of its mould, or man, to become the offspring, so must the mind be able to meet any or all conditions of environment of our life, and without opposition or de-

This latter state is one of a balanced, unorganized ether (the motion of every particle is reciprocally balanced by that of another) and is commensurable with the beginning of things. The finality of life organization, that it may meet its every environment, must too conform to this infinite, universal mould.

Should not the environment of thought, the environment which most truly binds us with all space and time, with God and our universe, by its very subtlety of power bring forth an organization capable of exerting strength not granted to man and through which it should obtain domain over realms whose borders at least seem visible to him?

³In the construction of a toy or of a machine man uses his strongest and least destructible material; whether Nature is constructing a toy or machine in our individual life she too will finally make it indestructible; the mind of man but parallels for short spacings the infinite mind of Nature.

structive action toward other life to become the soul,¹ a tiny reproduction of our Universe, or Son of God.

The soul has all and yet no properties, for in its perfection it conforms with all surrounding life. In the atom we have a duplication of the world, in the soul the duplication of the universe, or Image of our Creator.

The Darwinism of mind excludes opposition of life to any environment, and by it the lie in the mental sphere is of no greater value than the deception of the closed eye in the physical world. Dishonesty and other prostituted forces of mankind spring from internal mental discord,² and the mind practising them cannot exert self will, the foundation of highest life.

We must admit that he whom we designate as the "highest type of manhood" represents the best individual life for the community. It is clearly the most perfect form of social life that Nature is constructing for our world. Let us but for a moment consider what must be the characteristics of this life! If higher individual life is permitted at all it will be granted only to the highest type of life of our world.

Dishonesty if developed in all individuals to its fullest extent so as to control all human acts would soon brook revolution and chaos. Science tells us at least that man is the most beautiful organized mechanism known and thus furtherest removed from rudi-

¹Nature will not limit the freedom of her highest life. As a civilized being I will not hurl a stick of dynamite among my fellow men, though I may use it to shatter a boulder or some other obstacle. Although limitless power and freedom must be given to highest life, the restraining force, which is partially born in man, is expanded for this life, so that it evokes the same reverence and deterring will regarding all works of Nature that the human mind holds alone for its peers.

²Discord caused by the non-adaptability of life to its determining social mould or environment.

mentary life. The latter was generated by the laws of chance from unorganized or chaotic matter. From this state life is gradually progressing away and toward its most perfectly organized form. The man of character and self-control and the man of dishonesty¹ and weakness are both placed on the same path. Which of the two, gentle reader, is approaching the goal and who is nearest the starting point?

To the soul should be granted perfect free will, but satisfaction with the will and power of God over all other matter is necessary, and therefore the will of both child and parent must stand concurrent.²

Would a railroad continue in its employ an engineer, were he disposed to whirl his train by a set signal, and regain his lost time through such dishonesty, but thereby endanger his whole cargo? Remember the engineer in opening his throttle places under the control of a few ounces of brain the many tens of thousands of pounds of his train. Such power is permitted him because of man's insight into a few natural laws and his control of forms of matter governed by them. Once

¹Dishonesty is as a breach to the attack by fellow men and is, therefore, non-commensurable with indestructibility or immortality.

²That from the piece of coal can be constructed the thinking power of the mind is remarkable; but no more so than the judgment to which the mind is being subjected before it can enter the mould giving to it indestructibility.

Environment, extended through generations and thus called heredity, determines the mould we enter, it does not create the mould. With the birth of the universe the creation of all possible moulds took place.

The twentieth century may come to believe that moral filth will grate upon the sides of and prevent entrance to the immortal mould, even as the nineteenth century has come to see that physical filth tends to prevent our entrance to the perfect physical mould. The highest social laws are applicable but to highest life, and shape to the mould of this life.

in perfect unison with all Nature he will possess control from his tiny sphere of matter—almost infinitely small—of this infinitely great universe; a picture of the perfect sublimity of true materialism.

The case of the engineer is relative. Nature will put herself not under the control of one with destructive desire—the test must have been perfect. The Son of God must live with those below him in perfect unison; the whole structure of the universe must be complete.

As the relationship between the radius and the circle is infinite, and as we can express the same only imperfectly, so our mind from its imperfections, however slight, can never reach the infinite expression power of the soul, and must always remain slightly differentiated from it. Our very longing for the understanding of the infinite shows but our approach to life where our vision no longer will be limited, and where we shall comprehend the infinite Universe with its associations even now as we understand our finite world.

The unborn babe knows nothing of the life it is to enter. It is the wisdom of Nature. Wherever there is a sudden change or break in any of Nature's life-processes she most wisely tends to lessen the influence of former environment. The misery of impossible attainment would stultify all progress.

It is the mind practising self-control contingent with social laws that shall gain for its son immortality. Thus the man who lives the highest life consistent with conditions of environment, or he who obeys the moral law of non-opposition to existing life, is a subject for immortality. The ten commandments of our Bible, next to the life of Christ, the greatest gift to the

world, are probably our nearest approach to the expression of the laws necessary for such life.

Is there after all no science of religion? Have we not merely neglected this, the greatest of all sciences, for many generations, and during such period been unable to understand the tremendous value and power of the greatest laws ascertainable by man, but already discerned by him,—namely, those dealing with himself as object? The laws governing lower, as inorganic, forms of life, during our gradual ascent of the slope of life, have become clearly visible and their truth and value to-day are not doubted. But are we not still approaching to a higher pinnacle, although one whose summit already had been reached, even if by one who did not record the minute details of the surrounding landscape, from which the range of vision will be far greater?

The final step for the birth of the soul is not so far removed from man as man is from inorganic matter. Retribution determines both. Would we have the degenerate parent produce the healthy child? Christianity and the law of the "survival of the fittest"¹ are but parallel.

¹Darwin has shown us how in each successive stage Nature's living species have tended to better themselves. This should continue until a perfect form of life is attained. As long as reproduction is inherent within life its final stage has not been reached.

The cornerstone of imperialistic Darwinism would be the production from the ape of man. This is an experiment that might be carried out with success even though it should require thousands of years for completion. The truth of reason in this case has been, however, equal in strength to the truth established by the visual sense, so generally demanded by science. The cornerstone of the full structure of science would be set in place by the formation of atomic matter or of the protoplasm. The latter accomplishment, the author is led to believe, would have been

It is as hard for the scientist to-day to believe in immortality as it was for the ancients to believe in the spherical form of our earth. They needed the plain with its jumping-off points, and could not imagine how one could "walk upside down," and so the modern scientist requires their non-destructible "elemental"

held a generation ago as the death to man's belief in immortality. Either accomplishment in the future, it is my belief, will serve as a cornerstone to the proof of immortal life and to a universal religion.

The temperature at the surface of our sphere will make the production of the element most difficult and perhaps always prevent it. A neutral zone free from gravity and at the absolute zero is the womb for the birth of the chemical element. There are conditions in which the element tends to reproduce itself even as the protoplasm has the power of self-reproduction.

The formation of the metal in the present era would be a catastrophe to the human race; when civilization has reached a much higher level the reverse will be true.

The synthesis of the lowest form of the protoplasm should be accomplished during our century. To achieve this result will mean the building up of a "St. Peter's of Rome" within the point of a pin. Scientific finesse of workmanship should not fail even in such a task.

The reader may ask what the formation of elementary matter may have to do with religion. Religion is a science of nature as truly as any other science. With the foundation of knowledge necessary to produce the element or the protoplasm at man's disposal he will have the fullest natural knowledge attainable by him.

Over a century ago Dalton was busy with his atomic speculations. Only a half a century later Wohler conquered the organic molecule, urea. The Curies and Ramsay have but just discovered the bricks from which the atom is built, or α , β and λ rays. These most scientists consider as negatively or positively charged particles, whereas the author deals with them as negatively or positively constructed matter. In whatever light one may regard them it will be but a short period before the nature of these blocks and their arrangement within the atom are made clear to science and possibly they will be brought together and atomic matter conquered. The manner of formation of the diamond is understood, but man cannot sufficiently concentrate physical forces to form a diamond except of the tiniest magnitude; so it may be that man will likewise be unable to concentrate the necessary physical forces to produce the atom.

atoms. But lately we have been allowed to behold how even these wonderfully perfect structures may be torn apart, and with their destruction has come about the belief of the unity of matter as of the unity of energy, and the polytheistic beliefs of science have given place to those of true monism.

Each little atom represents an expression of God; when we have reduced this to a common-sense verbal expression it merely remains through patience to reduce it to an exact corresponding mathematical one. There will then be no more reason for designating our expression as theory (merely because we cannot see all the phenomena with our naked eye) than there is for saying that two and two make four by theory, or that our earth revolves around the sun by theory. Theory and fact coincide when the explanation of a phenomenon has been reduced to the simplest mechanical foundation.

Civilization to-day is groping for the possibility of higher intellectual and mortal life, and once religion, science, and philosophy (for natural philosophy or that based on scientific data is our true religion) are no longer at variance, the purposes of Nature and intellect will become parallel.

Whether matter and energy attain a final goal of immortality from man, of course none can say; but certainly they are striving as other forms before have strived and succeeded in gaining a more lasting and stable life. Every aggregation of matter is struggling for more extended, and thus finally infinite, environment and more perfect Immortality,¹ The Battle of All Existence.

¹If there were but a single being within the universe all

energy and matter would belong to this life. As there are, however, millions of lives within our universe only limited energy can be allotted each. The environment of the individual plant is represented by a few feet, that of man by thousands of miles. The environment which will be allotted to the supreme life of our universe will be infinite. The laws governing the vesting of energy must have become even more inherent to the individual life which is to enjoy the fullest environment than the highest degree of knowledge.

CONCLUSION

The more we examine the path of civilization the more we become impressed by the fact that it has always followed the same course. Thus in studying former civilization we find that similar truths have been opened to them at periods of development analogous to those of our own generation. Formerly by observation of hidden truths, and contact with fellow beings, the single pearl of truth was drawn from each and all.

To-day our scientists have observed largely natural phenomena, and up to the present have come to conclusions concerning matter very analogous to the theories of the Greeks. The great European mind has at its command a thousand pair of hands to overturn and spade the earth, that it may more accurately see the embedded hidden secrets, and not trust alone to those above the ground.

Those scientific theories which have been found not to stand the test of concurrency with Nature, have been relegated to the pages of mythology. What has been said attacks none of our present accepted scientific work.

Civilization will behold how clearly we are shown that Nature's every argument points to immortal life.¹

¹The laws of chance governing us demand that our universe must be infinite in size; if it were finite a coin tossed into space and landing with "head up" upon being tossed a second time would fall "tail up," or a definite number of "heads" would be followed by a like number of "tails." It requires infinite tosses to establish equality between "heads" and "tails;" only infinite action could bring about this result. Celestial mechanics can deal only with the finite.

Nature is developing our nobler, moral strength for birth of this life fully as truly as she produced other characteristics for determination of lower life.

If we wish to accept Darwinism, the first half of natural philosophy and that relating to the past of man, we had better accept the second half also, or that depicting his future. With its acceptance and the abolishment of the mythology pertaining to our religion the Church may light the world as it never has before; for with this light man may behold his own environment.

In the realm of the infinite in which we exist temporary life is purposeless and as nothingness. The man who believes that our life does not represent an integral part of the universe and was constructed without purpose and that individual life has been reared by Nature but to perish, is he right in his belief?

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